

WHAT IS CLAIMED IS

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1. A shape measurement system for measuring a three-dimensional shape of an object, comprising:

a picture taking part taking a picture of the object;

10 a projecting part applying light having a predetermined pattern onto the object;

a picture taking position specifying part detecting a position at which said picture taking part takes the picture of the object, and generating position  
15 information specifying the position;

a three-dimensional coordinate calculating part calculating a three-dimensional coordinate of each point of the object in accordance with the position information and an image taken at the position specified  
20 by the position information; and

a three-dimensional shape composing part expressing the each point by a coordinate in a single coordinate system and generating a composite image in accordance with at least two three-dimensional  
25 coordinates calculated for the each point by said three-

dimensional coordinate calculating part based on  
respective images obtained as a result of the picture of  
the object on which the light having the predetermined  
pattern is applied being taken from at least two  
5 different positions.

10 2. The shape measurement system as claimed in  
claim 1, further comprising:

a picture taking control part controlling  
operation timing of said picture taking part;

a signal converting part converting an analog  
15 signal obtained by said picture taking part into a  
digital signal; and

a storing part storing the digital signal,  
three-dimensional coordinate and composite image.

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3. The shape measurement system as claimed in  
claim 2, further comprising an interpolation part  
25 performing interpolation processing on at least one of

the image obtained by said picture taking part and the composite image obtained by said three-dimensional shape composing part.

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4. The shape measurement system as claimed in claim 1, further comprising a three-dimensional image  
10 generating part generating a three-dimensional image of the object in accordance with coordinates of the object obtained by said three-dimensional coordinate  
calculating part and an image obtained when the light having the predetermined pattern is not applied to the  
15 object by said picture taking part.

20 5. A shape measurement system for measuring a three-dimensional shape of an object, comprising:  
a plurality of picture taking parts with different optical centers taking pictures of the object;  
a projecting part applying light having a  
25 predetermined pattern onto the object;

a picture taking position specifying part  
detecting positions at which said plurality of picture  
taking parts take the picture of the object, and  
generating position information specifying the  
5 respective positions;

a three-dimensional coordinate calculating  
part calculating a three-dimensional coordinate of each  
point of the object for each image in accordance with a  
plurality of images obtained as a result of pictures of  
10 the object being taken by said plurality of picture  
taking parts, and the position information generated by  
said picture taking position specifying part; and

a three-dimensional shape composing part  
expressing the each point by a coordinate in a single  
15 coordinate system and generating a composite image in  
accordance with the plurality of three-dimensional  
coordinates for the each point calculated by said three-  
dimensional coordinate calculating part.

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6. The shape measurement system as claimed in  
claim 5, further comprising:

25 a plurality of picture taking control parts

controlling operation timing of said plurality of picture taking parts, respectively;

5 a plurality of signal converting parts converting analog signals obtained by said plurality of picture taking parts into digital signals, respectively; and

10 a storing part storing the digital signals obtained by said plurality of signal converting parts, three-dimensional coordinate calculated by said three-dimensional coordinate calculating part and composite image generated by said three-dimensional shape composing part.

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7. A shape measurement system for measuring a three-dimensional shape of an object, comprising a picture taking device taking a picture of an object and  
20 a computer:

wherein:

said picture taking device comprises:

a projecting part applying light having a predetermined pattern onto the object; and

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a picture taking position specifying part

detecting a position at which said picture taking part takes the picture of the object, and generating position information specifying the position; and

said computer comprises:

5           a three-dimensional coordinate calculating part calculating a three-dimensional coordinate of each point of the object in accordance with the position information and an image obtained as a result of the picture being taken at the position specified by the  
10 position information; and

          a three-dimensional shape composing part expressing the each point by a coordinate in a single coordinate system and generating a composite image in accordance with at least two three-dimensional  
15 coordinates calculated for the each point by said three-dimensional coordinate calculating part based on respective images obtained as a result of the picture of the object on which the light having the predetermined pattern is applied being taken from at least two  
20 different positions.

8. The shape measurement system as claimed in  
25 claim 7, wherein said computer further comprising an

interpolation part performing interpolation processing  
on the plurality of three-dimensional coordinates  
calculated by said three-dimensional coordinate  
calculating part.

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9. The shape measurement system as claimed in  
10 claim 7, wherein at least one of said projecting part  
and picture taking position specifying part is  
controlled by said computer.

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10. A picture taking device comprising a  
picture taking part taking a picture of an object, and  
further comprising:

20 a projecting part applying light having a  
predetermined pattern onto the object;

a picture taking position specifying part  
detecting a position at which said picture taking part  
takes the picture of the object, and generating position  
25 information specifying the position; and

a storing part storing an image obtained as a result of the picture of the object on which the light having the predetermined pattern is applied being taken by said picture taking part, and the position

5 information.

10 11. The picture taking device as claimed in claim 10, wherein at least one of said projecting part and said picture taking position specifying part is controlled by a control signal provided externally.

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12. The picture taking device as claimed in claim 10, wherein said picture taking part also takes a picture of the object onto which the light having the predetermined pattern is not applied.

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13. A shape measurement method of measuring a three-dimensional shape of an object, comprising the steps of:

- a) applying light having a predetermined pattern onto the object;
- b) detecting a position at which said step a) takes the picture of the object, and generating position information specifying the position;
- c) calculating a three-dimensional coordinate of each point of the object in accordance with the position information and an image obtained as a result of the picture being taken at the position specified in said step b); and
- d) expressing each point by a coordinate in a single coordinate system in accordance with at least two three-dimensional coordinates calculated for each point in said step c) based on respective images obtained as a result of picture of the object on which the light having the predetermined pattern is applied being taken from at least two different positions in said step a).

14. The method as claimed in claim 13,

further comprising the step of:

- e) generating a three-dimensional image of the object in accordance with coordinates of the object in the coordinate system, and an image of the object obtained in said step a) when the light having the predetermined is not applied thereonto.

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15. A shape measurement method of measuring a three-dimensional shape of an object, comprising the steps of:

- a) applying light having a predetermined pattern onto the object;

- b) taking pictures of the object through a plurality of picture taking parts having different optical centers;

- c) detecting positions at which said plurality of picture taking parts take the pictures of the object, and generating position information specifying the positions, respectively;

- d) calculating a three-dimensional coordinate of each point of the object for each image in accordance with a plurality of images obtained as a result of

pictures of the object on which the light of the predetermined is applied being taken by said plurality of picture taking parts, and the position information generated in said step c); and

- 5           e) expressing the each point by a coordinate in a single coordinate system in accordance with the plurality of three-dimensional coordinates of each point calculated in said step d).

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16. A computer readable recording medium in which a program for measuring a three-dimensional shape of an object through a computer, said program causing the computer to:

- 15           calculate a three-dimensional coordinate of each point of the object in accordance with an image obtained as a result of a picture of the object on which light having a predetermined pattern is applied being taken, and position information specifying a position at which the picture of the object is thus taken; and

- 20           express the each point by a coordinate in a single coordinate system in accordance with at least two  
25   three-dimensional coordinates calculated for each point

based on respective images obtained as a result of picture of the object on which the light having the predetermined pattern is applied being taken from at least two different positions.

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17. The computer readable recording medium as  
10 claimed in claim 16, wherein said program causes  
an acceleration sensor to generate the  
position information specifying the position with  
respect to the gravitation; and  
a magnetic sensor to generate the position  
15 information specifying the position with respect to the  
terrestrial magnetism.

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18. The computer readable recording medium as  
claimed in claim 16, wherein said program causes an  
angular velocity sensor to detect a rotational angular  
velocity around each coordinate axis of the three-  
25 dimensional coordinate system.

19. The computer readable recording medium as claimed in claim 16, wherein said program further causes the computer to generate a three-dimensional image of the object in accordance with the coordinates of the object in the single coordinate system, and an image of the object obtained through taking picture of the object on which the light having the predetermined is not applied.

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20. A computer readable recording medium for measuring a three-dimensional shape of an object through a computer, said program causing the computer to:

calculate a three-dimensional coordinate of each point of the object for each image in accordance with a plurality of images obtained as a result of pictures of the object on which the light of the predetermined is applied being taken by a plurality of picture taking parts, and position information specifying positions at which the pictures of the object are taken by the plurality of picture taking parts; and express the each point by a coordinate in a single coordinate system in accordance with the thus-

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calculated three-dimensional coordinates for the each point.